ILLINOIS NATURAL HISTORY SURVEY
PRAIRIE RESEARCH INSTITUTE

Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs: Annual Report 2013

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Annual Summary Report

Project Title:
Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs.

Project Number: RC13CREP01

Contractor information:

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Annual Reporting Period: 1 July 2012—30 June 2013

Annual Project Report Due Date: 28 August 2013

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Goals/ Objectives: (1) Develop and initiate monitoring program that provides a basin-wide assessment of status and trends for aquatic life in wadeable streams of the Kaskaskia River; (2) track the status of selected populations of sensitive species in focal reaches of the Kaskaskia River associated with enhanced DO regulations, BSS designation, and presence of SGNC; (3) evaluate the influence of conservation easements and associated practices on biological communities within the Kaskaskia River Basin.

Title: Monitoring and Assessment of Aquatic Life in the Kaskaskia River for evaluating IDNR Private Lands Programs

Narrative:

Work during the beginning of the reporting period focused on aggregation and summarization of existing biological and landscape data. We have reviewed and integrated into our database system spatial locations of collections and monitoring data from IDNR/IEPA Intensive Basin Survey Program, IDNR biennial fisheries surveys. Additionally we have secured the IEPA ambient water quality monitoring for the past 10 years within the Kaskaskia River and its tributaries. Biological survey data, watershed characteristics, and additional information concerning anthropogenic stressors have been assembled and georeferenced for the basin. This includes information on landuse/ landcover, surficial geology, modeled flow and water temperature, and point locations from ongoing and historic sampling and monitoring efforts. Locations of CRP/CREP parcels, NPDES permits, stream segments with enhanced dissolved oxygen designation, and stream segments with biologically significant stream designation have also been incorporated into the project GIS data layers.

The second half of the reporting period focused on preparation for the field season and beginning the spring and summer sampling programs. Project staff also attended the March meeting of the Kaskaskia Watershed Association in Carlyle to meet with regional constituents and researchers. After coordinating with CREP Mapping Coordinator Lisa Beja on availability of spatial data for CRP and CREP parcels in the study area we attributed local watersheds (1:100,000) throughout the Kaskaskia Basin with summaries of total and local catchment CRP/CREP enrollments to assist with sampling site selection. Private lands practices were classified by their expected efficiency at mitigating sediment and nutrient runoff and local watersheds were classified (high quality, moderate quality, low quality). We developed strata (HUC8, stream size, proportion of CRP/CREP enrolled land) and randomly selected stream reaches for basin-wide monitoring that span the range of conditions within the Kaskaskia Basin.

Spring sampling was conducted at 33 sites and included basic habitat, water quality, and biological collections following the protocol established by the Critical Trends Assessment Program (CTAP). The summer sampling program revisited these sites and conducted basic water quality, habitat quality, and biological (electrofishing, rapid macroinvertebrate) sampling. We also sampled 15 sites within stream reaches designated with enhanced dissolved oxygen status and as Biologically Significant Stream segments. Basic water quality data, habitat surveys, and macroinvertebrate collections were made at these focal sites.

A minor budget revision was made to allow for the purchase of a backpack stream shocking unit to be used in fish collections. Having a dedicated stream shocking unit available for the project allowed us to adjust our sampling schedule to coincide with

appropriate weather and flow conditions. Total budget and project scope were not changed as a result of this budget adjustment.

These efforts were conducted by one full time and one part-time research scientist and several hourly workers. We hired Eric James South to assist Dr. DeWalt with macroinvertebrate sample processing of existing samples and biodiversity assessment of EPT taxa during the Spring sampling period. Eric will begin a graduate program in Entomology in Fall 2013 at University of Illinois Urbana-Champaign and continue to work as part of the project group. We also successfully recruited an additional graduate student to work with Dr. Cao. Levi Drake will join our team in the Fall 2013 Semester pursuing an MS degree at the University of Illinois Urbana-Champaign in the Department of Natural Resources and Environmental Sciences. A total of six summer workers (some part-time) assisted permanent staff with collecting basin-wide and focal reach monitoring data during the summer sampling period.

Objective 1: Basin-wide status and trends (basin-wide monitoring).

Existing Data: We focused on incorporating existing biological and limnological data within our GIS framework and using these data to select sampling locations for basin-wide monitoring and assessment.

We coordinated with IDNR Stream Specialists (Randy Sauer and Trent Thomas) on obtaining site location and access to fisheries data for recent samples as well as earlier collections (Figure 1). The initial IDNR/IEPA Intensive Basin Survey (IBS) sampling (1982-1983) included 128 stations throughout the Kaskaskia basin. The 2012 IBS sampling program included stations on the Kaskaskia River with a total of 56 sites visited. Fish assemblages have also been sampled biennially at eight stations and these data are currently available from IDNR's sportfish analysis system (SAS) database through 2011 (QA/QC is ongoing). Additional records of fisheries (Figure 2a) and mussel (Figure 2b) samples have also been incorporated into the Kaskaskia assessment database. Project staff also uncovered historic (1952-1969) INHS fisheries data from 65 stations in the Kaskaskia Basin that were sampled prior to the construction of the USACE dams that created Lake Shelbyville and Carlyle Lake. These data have also been incorporate into our database to assist with establishing baseline conditions for fish assemblages.

Total upstream (Figure 3a) and local watersheds (Figure 3b) varied greatly in the proportion of CRP/CREP enrollments in the Kaskaskia Basin with higher enrollment levels in the central part of the watershed. CRP/CREP practices were rated and assigned into three categories (High, Moderate, Low) based on their expected efficiency at reducing sediment and nutrient loading to streams (Figures 4a-c).

Stratified random sampling was used to select stream reaches within each combination of Hydrologic Unit (4 HUC8s), stream size (2 classes of wadeable stream), and proportion

of CRP/CREP (5 classes) in the local watershed (Figure 5). A total of 104 sampling locations were selected for basin-wide monitoring over the course of the project.

Spring Sampling: We collected macroinvertebrate, habitat quality, and basic water quality information at 33 sampling locations during May and early June of 2013 (Table 1). For each acceptable site, a dipnet was used to collect macroinvertebrates from two high energy microhabitats and two low energy microhabitats. Specimens were individually picked from debris examined in collecting trays and subsequently stored in 95% ETOH. Water temperature, dissolved oxygen, percent saturation of dissolved oxygen, conductivity and pH were recorded using a Quanta hydrolab. Observations were recorded for general land use, erosion, stream morphology, sediment characteristics, water surface oils, weather conditions and collected invertebrate taxa. Habitat assessment was recorded for 12 parameters suggested by the Critical Trends and Assessment Program. This work will continue in subsequent years of the project at additional sites.

Summer Sampling: A training session was conducted for summer staff and 32 of the randomly selected locations were sampled during the 2013 summer sampling season including revisits to sites that had been sampled during the Spring survey (Figure 6; one revisited site was too large for wadeable stream electrofishing and was not sampled during the summer sampling period). During these site visits we sampled two different biological communities: fish (using an electric seine or backpack electrofishing unit at small sites) and macroinvertebrates (using a 20 jab method proportional to available habitat). Fish were identified and processed at the site and returned to the stream while macroinvertebrate samples were preserved in ethanol and stored for later processing. Basic water quality information (water temperature, pH, specific conductance, dissolved oxygen) was collected using a portable field meter (HACH model HQ40) and nutrient chemistry (N and P using a HACH DR 900 Multiparameter Handheld Colorimeter) data were also collected during these site visits. Information for two qualitative habitat indices (QHEI [Ohio EPA 2006] and IHI [Sass et al. 2010]) was recorded at each site. This work will continue in subsequent years of the project at additional sites.

Objective 2: Status of sensitive species (focal reach monitoring).

Spatial data for Biologically Significant Stream Segments (BSS; Bol et al. 2007, State of Illinois 2008), enhanced Dissolved Oxygen segments (IDNR/IEPA 2006) (Figure 7), CAFOs, and CRP/CREP parcels was obtained and integrated into our GIS (Figures 3a, b). These data form the basis for selection of focal reaches for monitoring. Point source locations (Figure 8) and Water quality data from the past 10 years were secured from IEPA Ambient Water Quality Network staff for nutrients (NH_4, NO_3-NO_2, TP, PO_4) throughout the basin (Figure 1).

Locations for all fish and mussel samples that we have been able to acquire have been georeferenced. Distribution maps of sensitive fish species have been reviewed. Maps of mussel species distribution are being developed. We reviewed known distributions of

fish and mussels in the basin using IDNR and INHS databases to identify additional monitoring needs and potential focal species. We have also discussed using these data to model "natural distributions" for fish and mussel species.

Habitat Data: We characterized the physical and chemical habitat of 15 sites within focal reaches by collecting basic water quality data, conducting a habitat survey, and placing a series of water temperature monitors in enhanced DO reaches that overlap with BSS segments (Figure 7). Macroinvertebrate samples were also collected at these sites using the 20 jab method proportional to available habitat. These efforts will continue in subsequent years of the project at these sites.

Fish Community Data: We collected a total of twelve fish samples in consecutive reaches along five stream segments within the Kaskaskia basin (Figure 6, intense sites). These samples will be used to evaluate the efficiency of our collection methods, track species fidelity to local habitat conditions, and improve our ability to assess the distribution and abundance of rare species in the basin. These efforts will continue in subsequent years of the project at additional sites.

Mussel Community Data: We coordinated with INHS staff responsible for statewide mussel collections (Illinois State Wildlife Grant T-53) to obtain mussel collections data from the Kaskaskia River and its tributaries. Sample station locations and species collection records through the 2012 field season have been secured (Figure 2b). During these surveys (2009 – 2012) ninety-five sites within the Kaskaskia River Watershed were sampled for mussels with live individuals of 29 species (32 species total including relic shells) collected (Shasteen et al. 2013). No young individuals (i.e., fewer than 4 growth rings) were found in twelve of these species suggesting a lack of recent successful reproduction.

Objective 3: Influence of private land conservation efforts (fixed site monitoring).

Project staff have meet with personnel from the Illinois State Water Survey (ISWS; Laura Keefer and John Beardsley) to discuss collaborative sampling efforts and coordinate staff recruitment. We are working with ISWS staff on identifying fixed-site monitoring locations that can take advantage of their data intensive discharge, sediment, and nutrient monitoring.

ISWS is looking for sites in relatively small drainages with little influence from large-scale water withdrawals or additions from industrial or municipal facilities (i.e., without major water control structures or point discharges). The current focus is on investigating site locations along Lost Creek, Shoal Creek, Silver Creek, and Hurricane Creek.

We expect to collect baseline data from locations associated with ISWS monitoring locations as they are established. This work is ongoing.

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Shasteen, D.K., S.A. Bales, A.P. Stodola. 2013. Freshwater mussels of the Kaskaskia River basin. INHS Technical Report 2013(08).

State of Illinois, 2008. Integrating Multiple Taxa in a Biological Stream Rating System. Illinois Department of Natural Resources, Springfield, IL. 34 pp.

Table 1. Spring Sampling Locations for macroinvertebrates, habitat, and water quality (CTAP methods).

Reach Code	County	Body of Water	Latitude	Longitude	Date Sampled
K15	Champaign	Kaskaskia Ditch	40.08007	-88.34995	05/14/13
K46	Champaign	Kaskaskia Ditch	40.01112	-88.34871	05/14/13
K273	Moultrie	West Okaw River	39.65996	-88.68392	05/15/13
K299	Moultrie	West Okaw River	39.64975	-88.69464	05/15/13
K754	Shelby	Angel Branch	39.44958	-88.95811	05/16/13
K795	Shelby	Mud Creek	39.40991	-88.89952	05/16/13
K992	Shelby	Mitchell Creek	39.31132	-88.88154	05/22/13
K1160	Shelby	Mitchell Creek	39.25612	-88.89892	05/22/13
K1250	Shelby	Polecat Creek	39.23119	-88.91961	05/22/13
K1900	Fayette	Trib. Of Linn Creek	39.03952	-89.01681	05/23/13
K2182	Fayette	Vandalia Ditch	38.97686	-89.06161	05/23/13
K2261	Fayette	Raccoon Creek	38.92369	-89.20036	05/23/13
K3126	Madison	Sugar Creek	38.69154	-89.64869	05/24/13
K3536	Clinton	Sugar Creek	38.57401	-89.63127	05/24/13
K3621	Clinton	Sugar Creek	38.55367	-89.64402	05/24/13
K3386	Clinton	Lake Branch	38.62847	-89.57501	05/28/13
K3496	Clinton	Trib. Of Beaver Creek	38.57861	-89.45931	05/29/13
K3570	Marion	Trib. Of Crooked Creek	38.56233	-89.01046	05/29/13
K3963	Washington	Webster Creek	38.48457	-89.15375	05/29/13
K2858	Marion	East Fork Kaskaskia River	38.76218	-88.94841	05/30/13
K3107	Marion	Crooked Creek	38.67911	-88.90274	05/30/13
K3380	Marion	Trib of Brubaker Creek	38.60731	-88.89476	05/30/13
K2756	Marion	North Fork Kaskaskia River	38.78694	-88.97711	05/31/13
K2232	Bond	Headwater Governor Bond Lake	38.93551	-89.34005	05/31/13
K1474	Montgomery	East Fork Shoal Creek	39.17352	-89.36142	06/03/13
K1542	Montgomery	East Fork Shoal Creek	39.14887	-89.35163	06/03/13
K1581	Montgomery	East Fork Shoal Creek	39.14298	-89.35374	06/03/13
K1635	Montgomery	Miller Creek	39.11608	-89.47446	06/04/13
K1648	Montgomery	East Branch Lake Fork	39.11686	-89.63176	06/04/13
K1879	Montgomery	Grove Branch	39.04552	-89.62346	06/04/13
K2668	Bond	Shoal Creek	38.80671	-89.5074	06/05/13
K2349	Bond	Dorris Creek	38.90523	-89.53351	06/05/13
K1104	Montgomery	Blue Grass Creek	39.26891	-89.53411	06/05/13

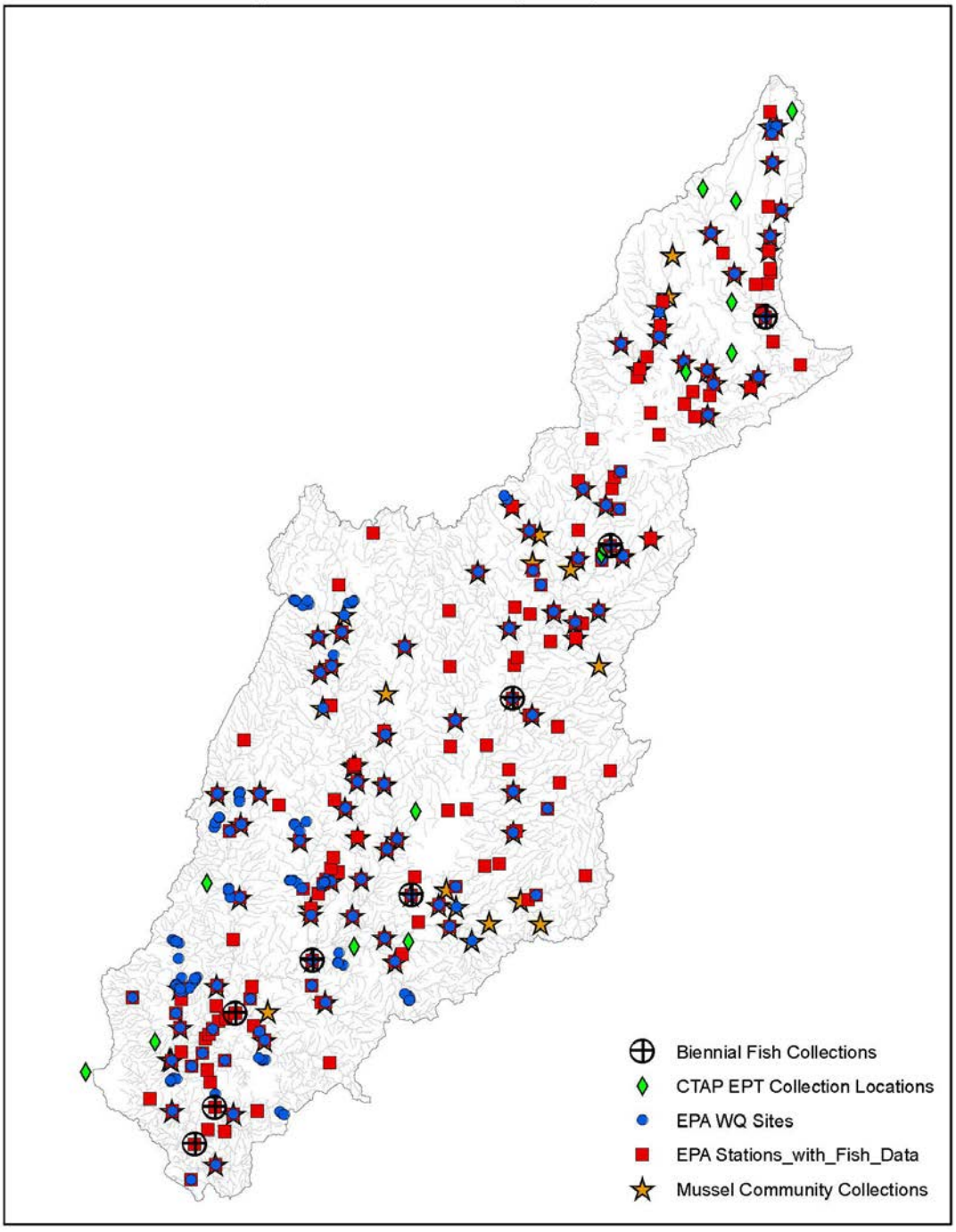

Figure 1. Locations of historical biological and water quality monitoring stations in the Kaskaskia River basin. Type of data collected and temporal coverage varies between locations.

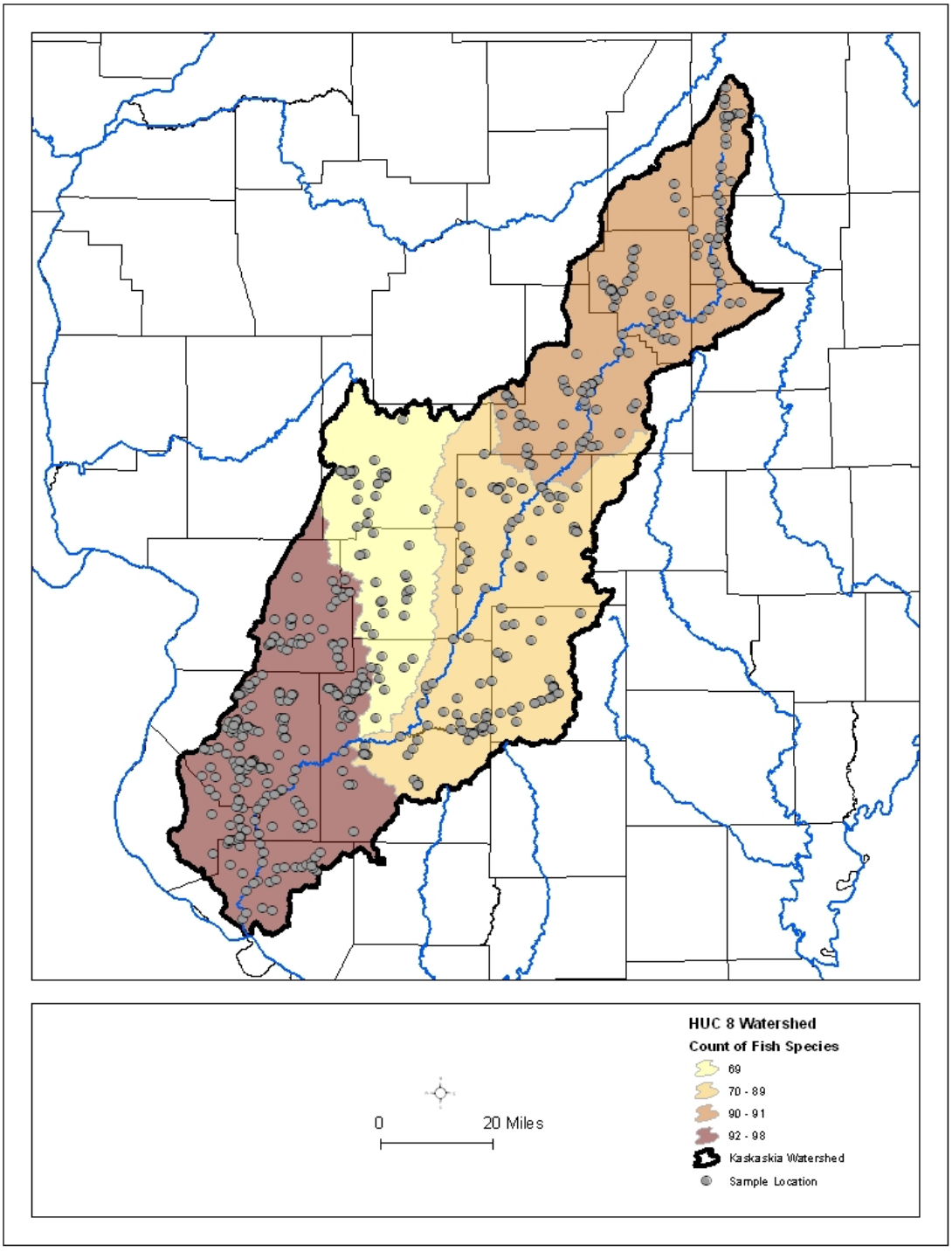

Figure 2a. Fish species richness within the Kaskaskia River basin. Total number of fish species recorded by HUC 8 watershed (Note: Not all existing sample locations are depicted).

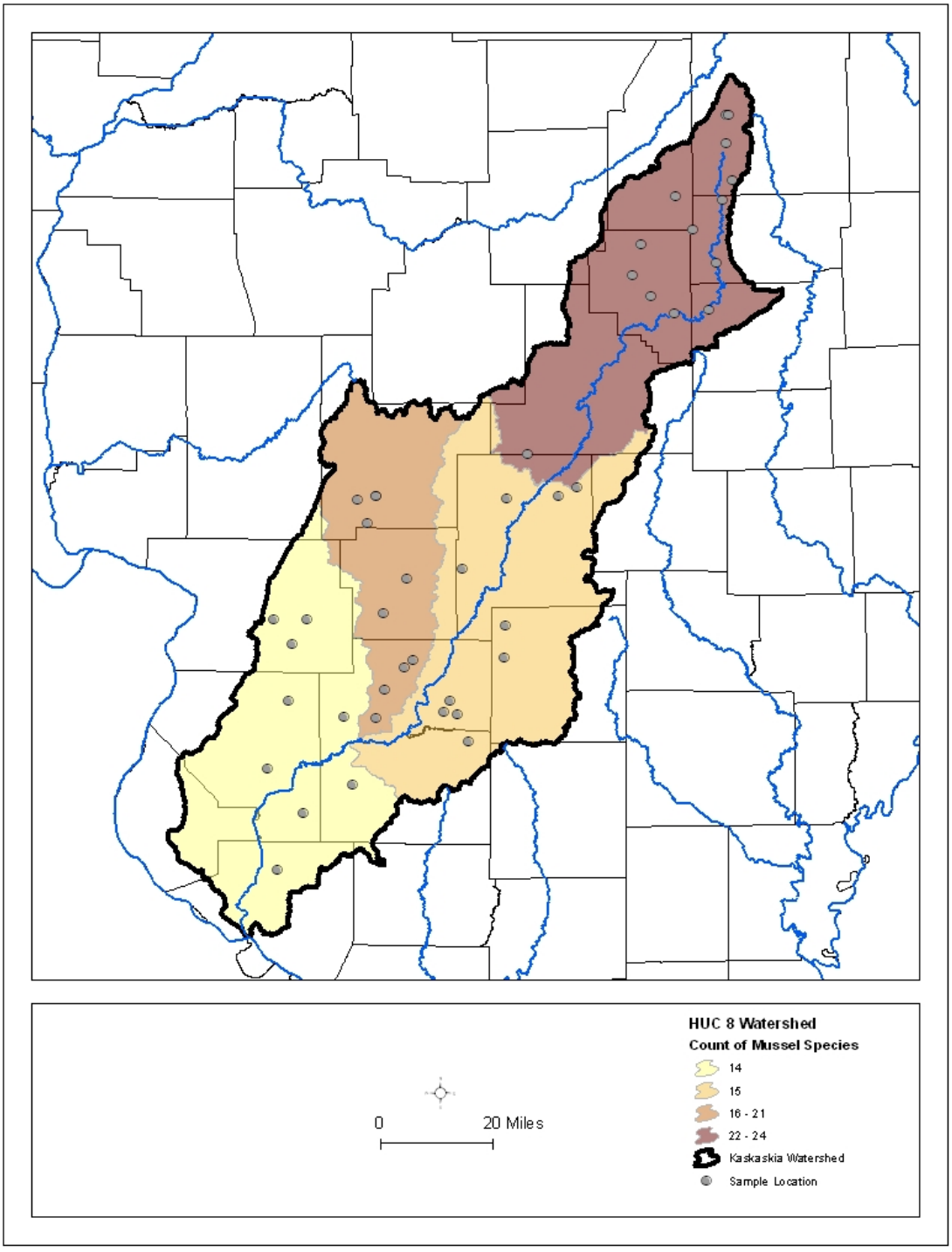

Figure 2b. Mussel species richness within the Kaskaskia River basin. Total number of mussel species within each HUC 8 watershed (Note: Not all existing sample locations are depicted).

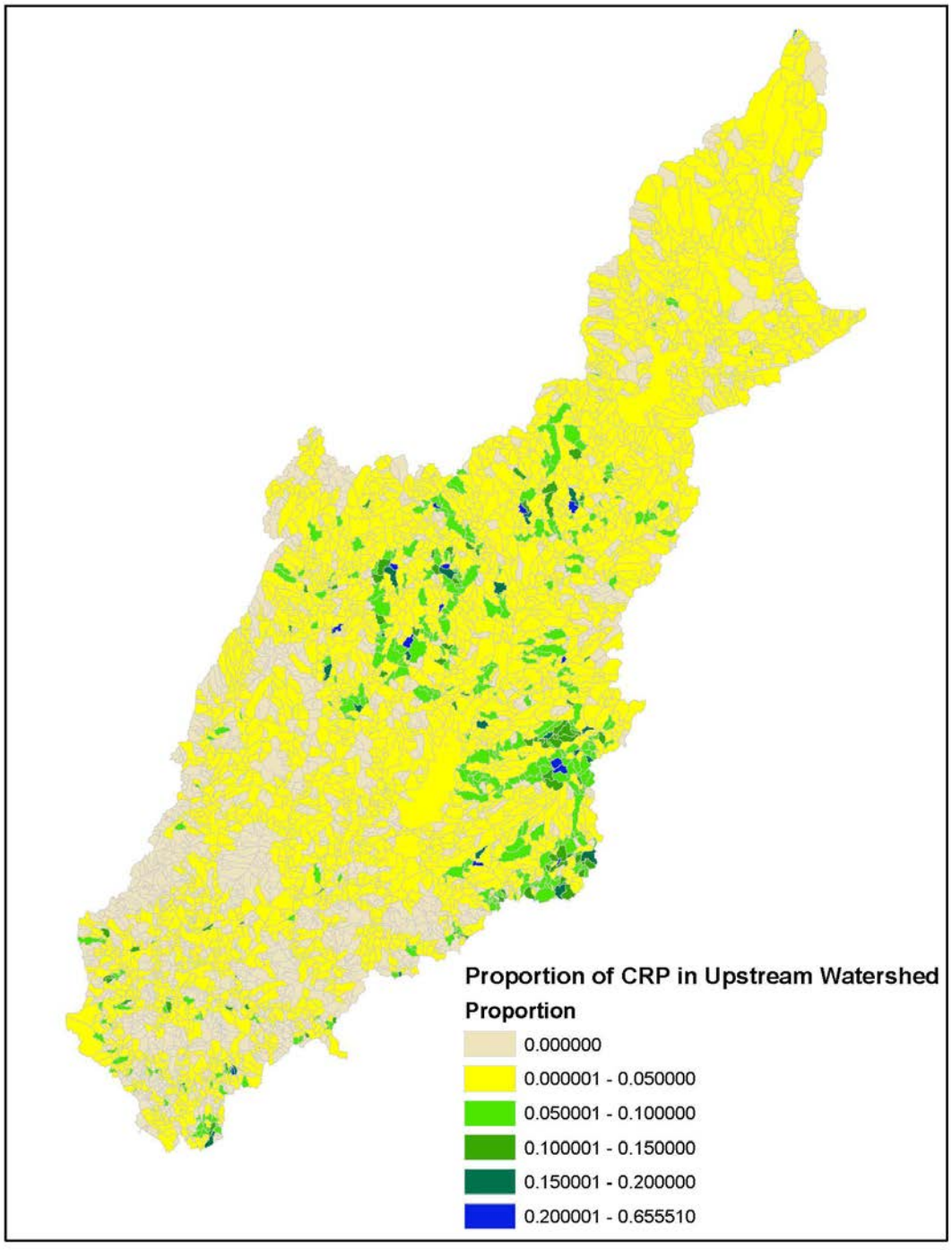

Figure 3a. Proportion of total upstream watershed containing land enrolled in the Conservation Reserve Program (CRP or CREP) in the Kaskaskia River basin.

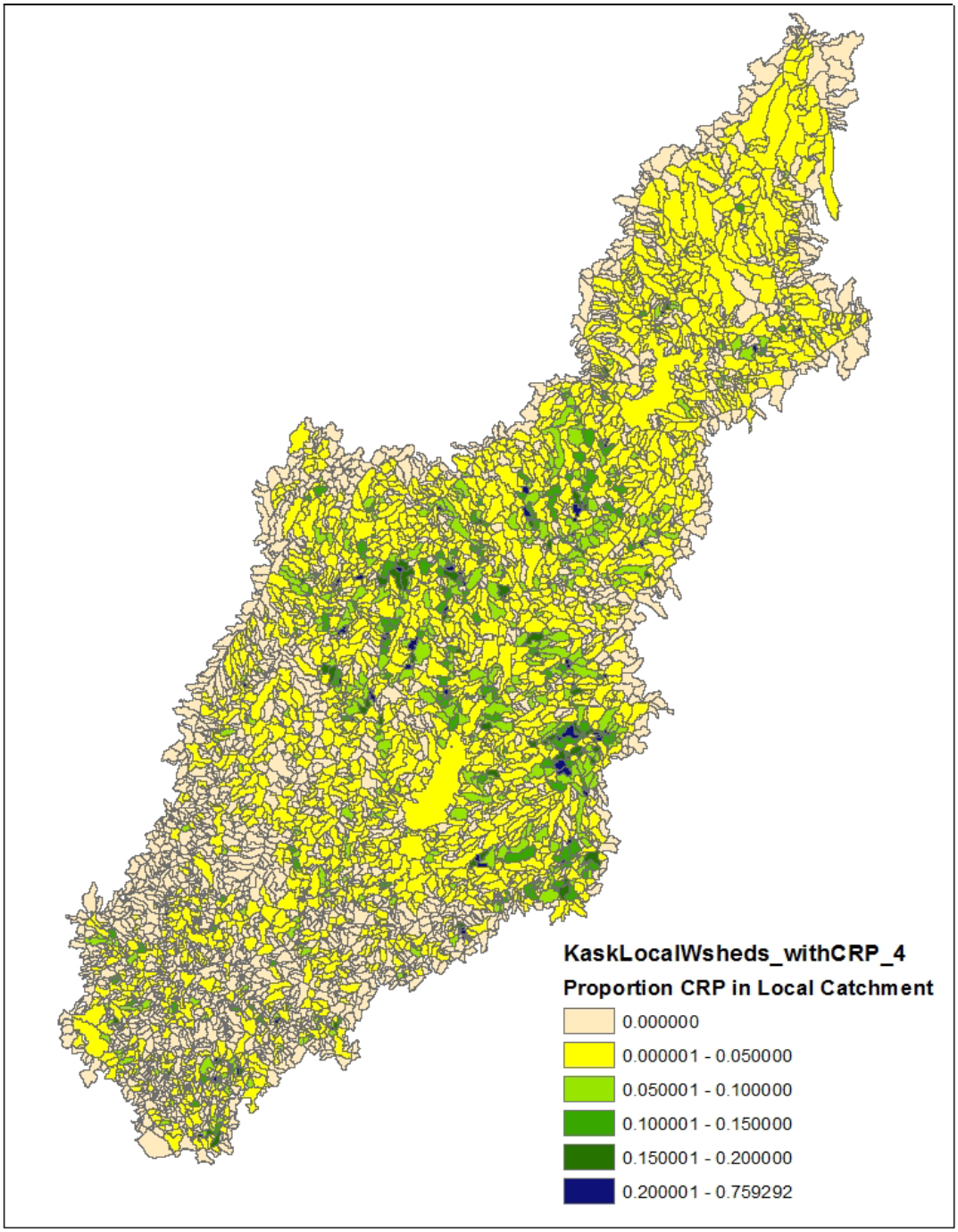

Figure 3b. Proportion of local watershed containing land enrolled in the Conservation Reserve Program in the Kaskaskia River basin.

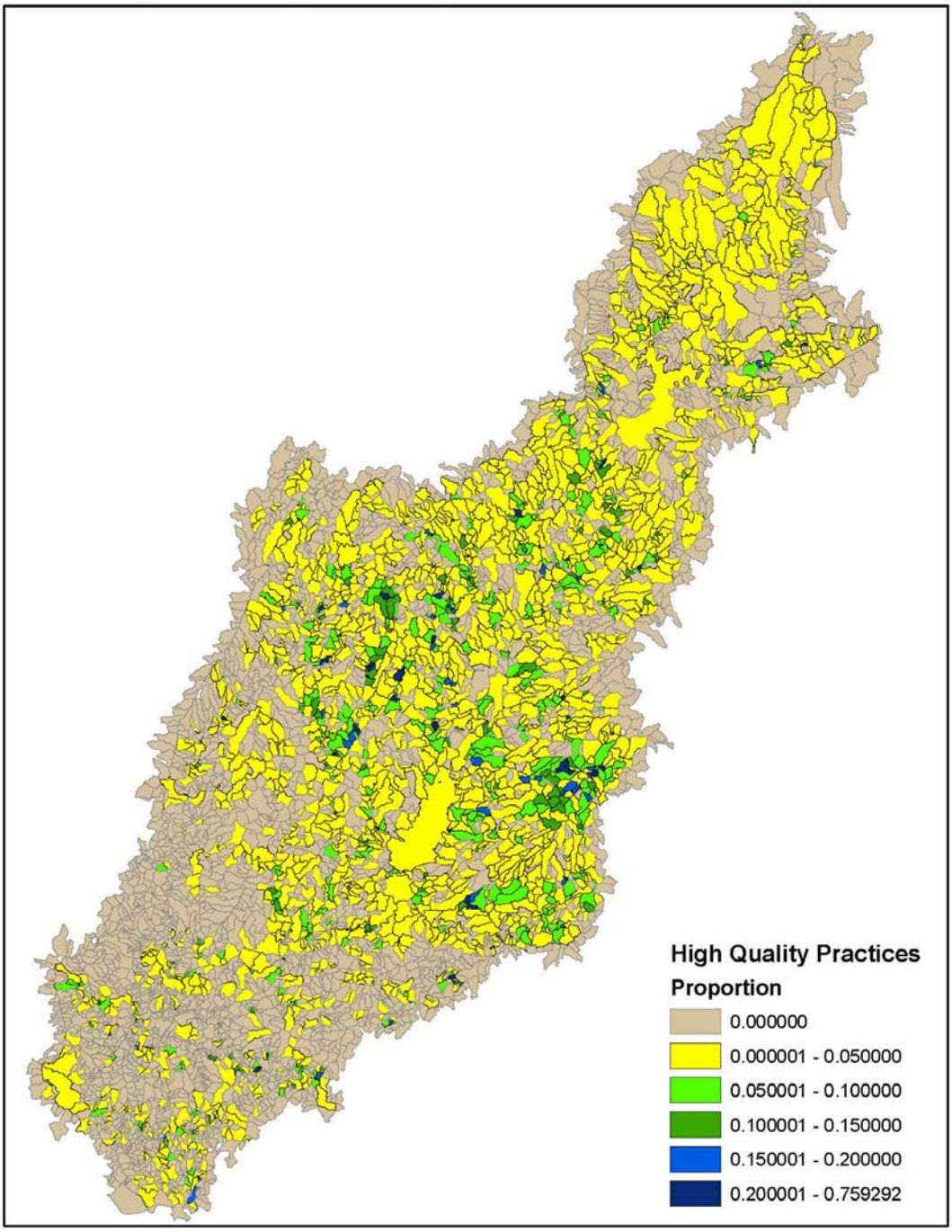

Figure 4a. Proportion of local watershed containing land enrolled in the Conservation Reserve Program in the Kaskaskia River basin having practices with high expected reductions in runoff and/or loading of sediments and nutrients.

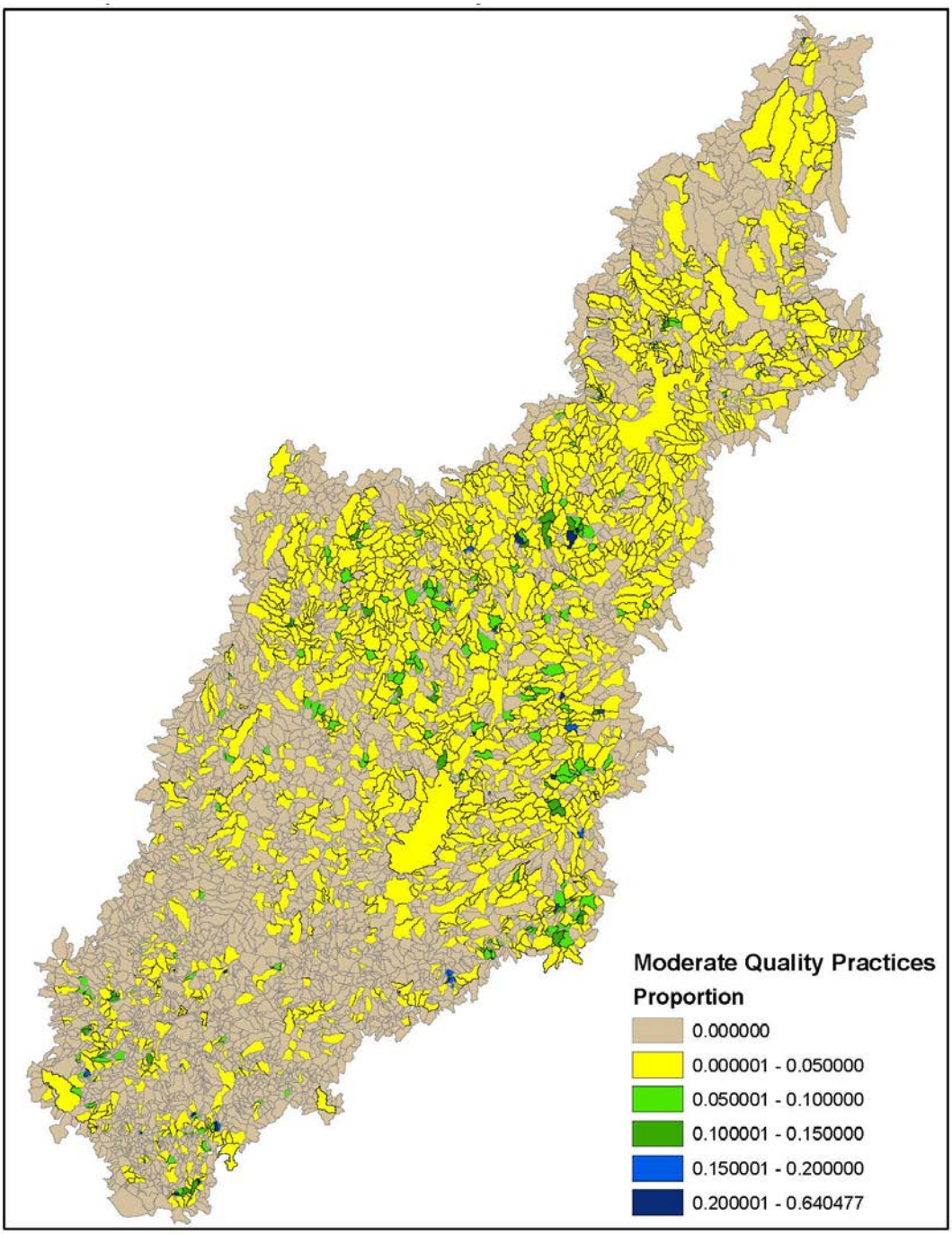

Figure 4b. Proportion of local watershed containing land enrolled in the Conservation Reserve Program in the Kaskaskia River basin having practices with moderate expected reductions in runoff and/or loading of sediments and nutrients. These practices often focus on wildlife habitat rather than improving instream condition.

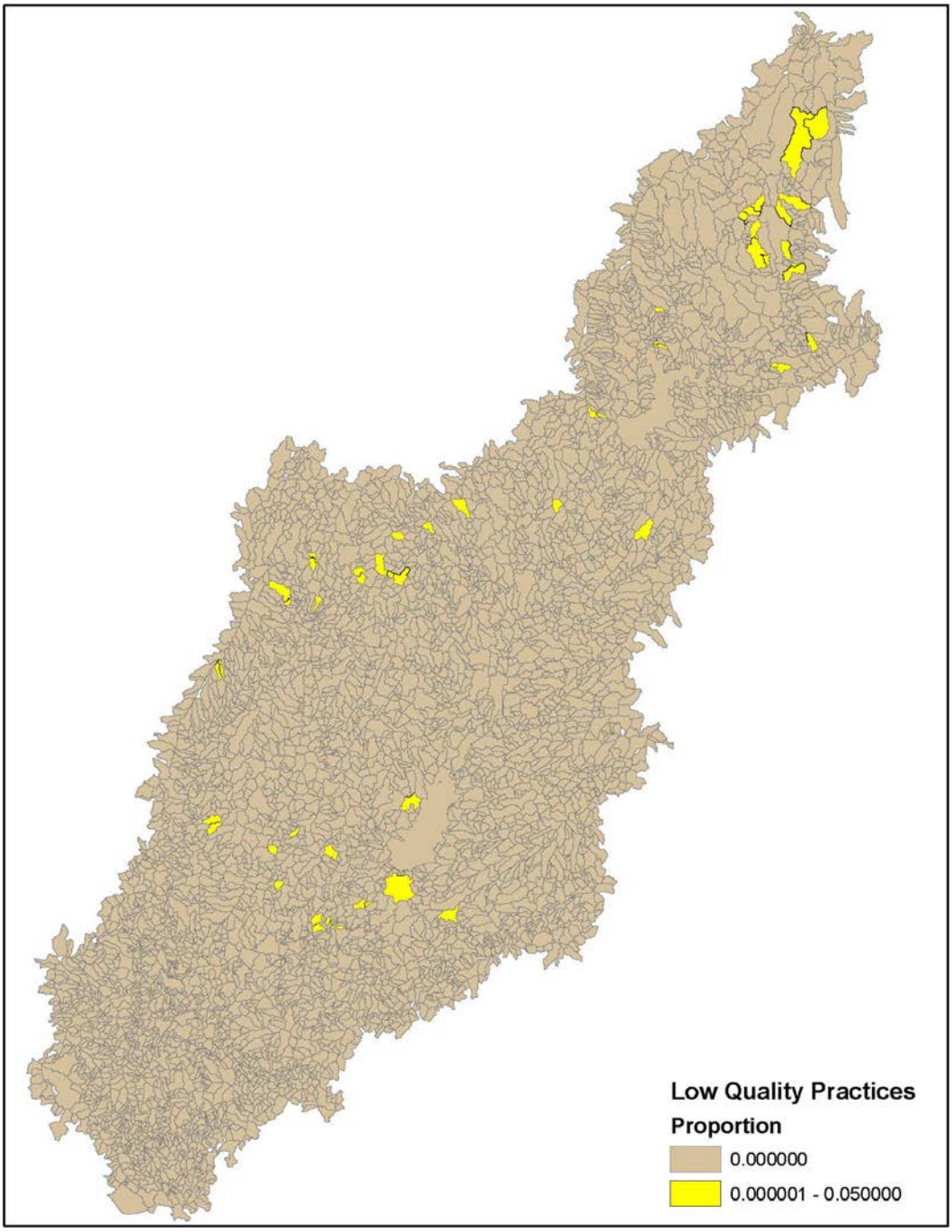

Figure 4c. Proportion of local watershed containing land enrolled in the Conservation Reserve Program in the Kaskaskia River basin having practices with low expected reductions in runoff and/or loading of sediments and nutrients. These practices often focus on wildlife habitat rather than improving instream condition.

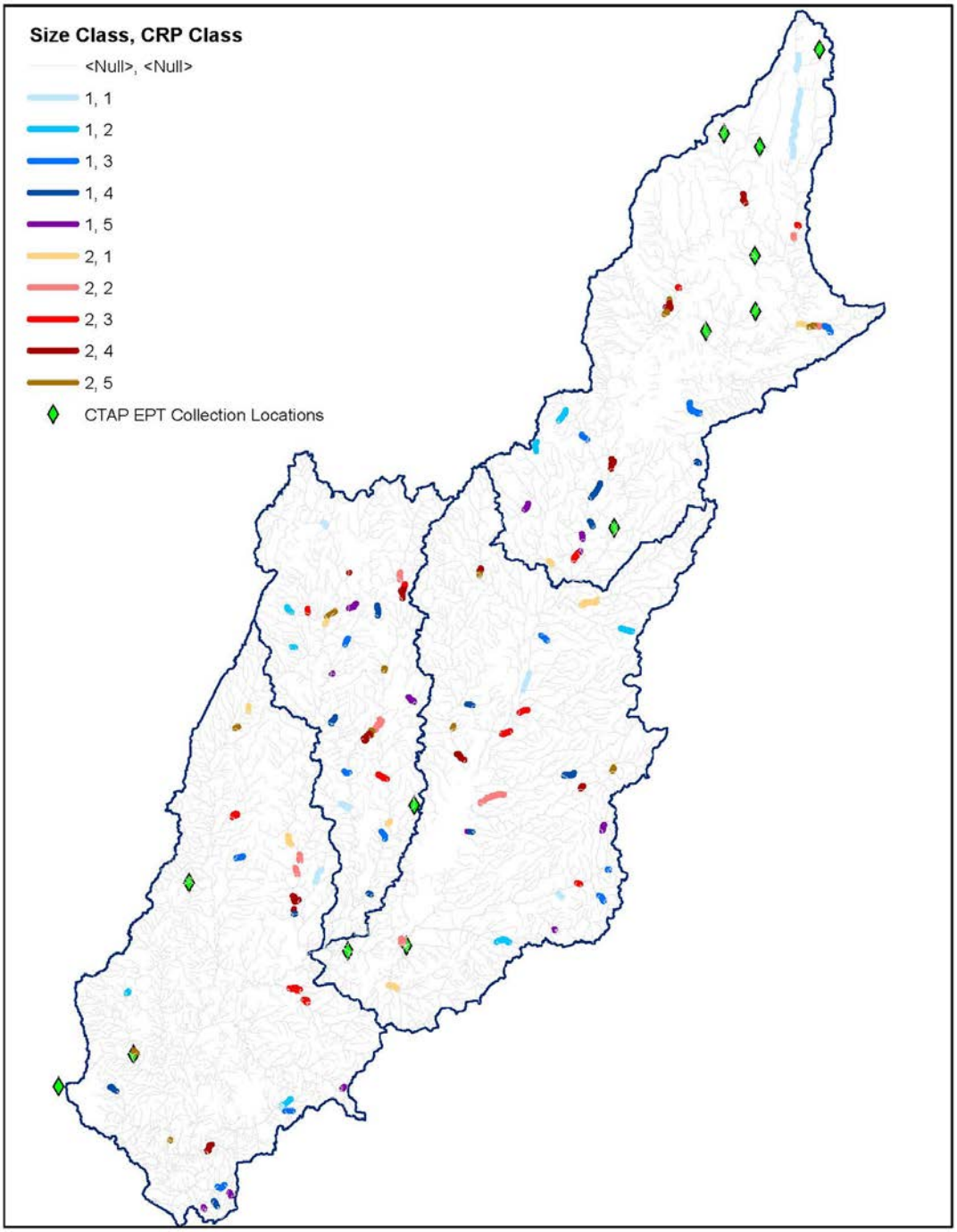

Figure 5. Sampling reaches selected for characterization of status and trends in the Kaskaskia River basin. Sampling locations were randomly selected based on three strata: HUC8, stream size (small, moderate), proportion of CRP/CREP lands in the watershed (see Figure 3a for CRP/CREP classes).

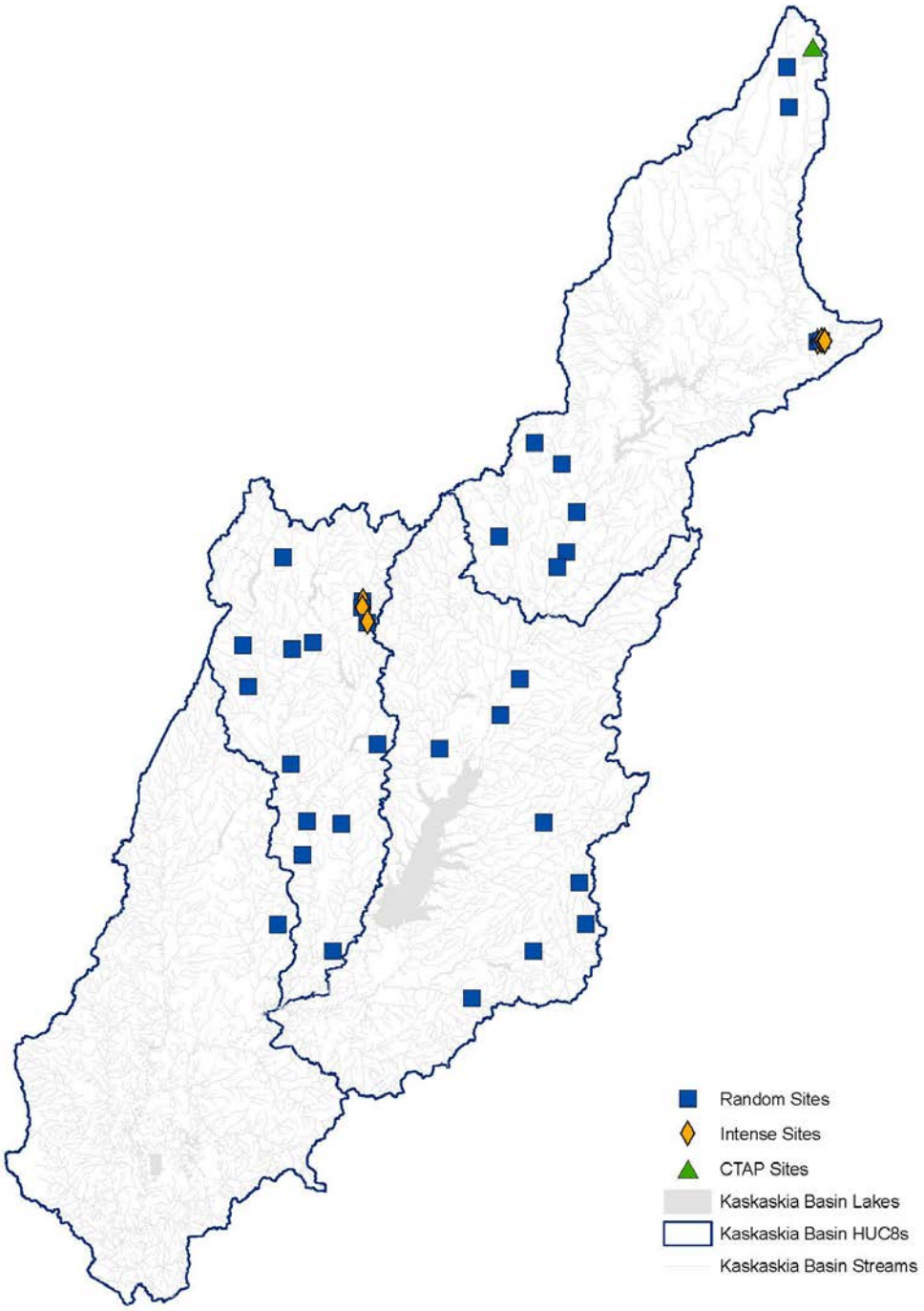

Figure 6. Locations of basin-wide status and trends sites visited in the Kaskaskia River basin during the summer 2013 sampling program. Intensive fish sampling reaches and one CTAP site visited during 2013 sampling program also depicted.

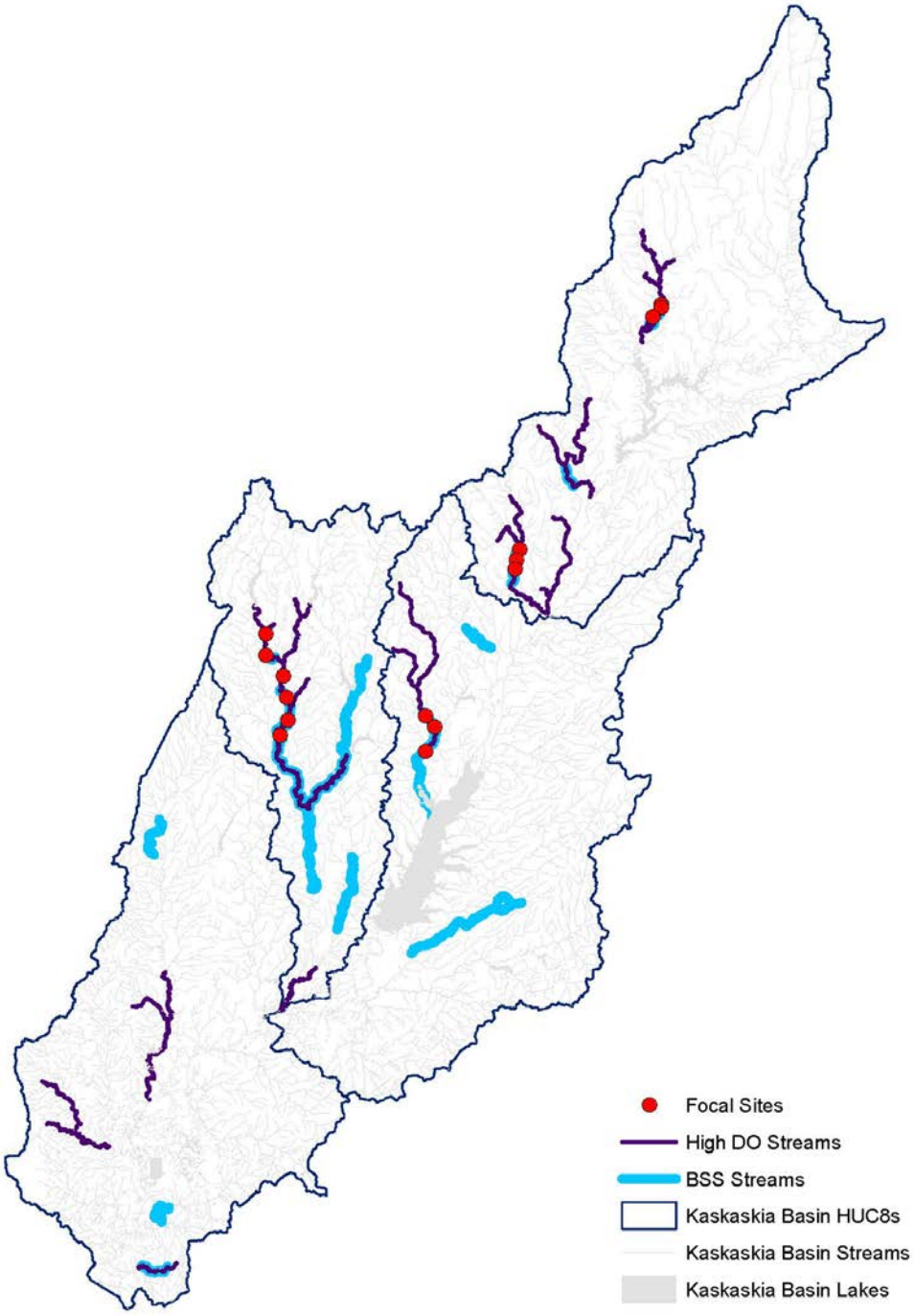

Figure 7. Enhanced Dissolved Oxygen reaches and Biologically Significant Stream segments in the Kaskaskia River basin. Focal sites were selected to characterize the physical and chemical habitat of these stream reaches.

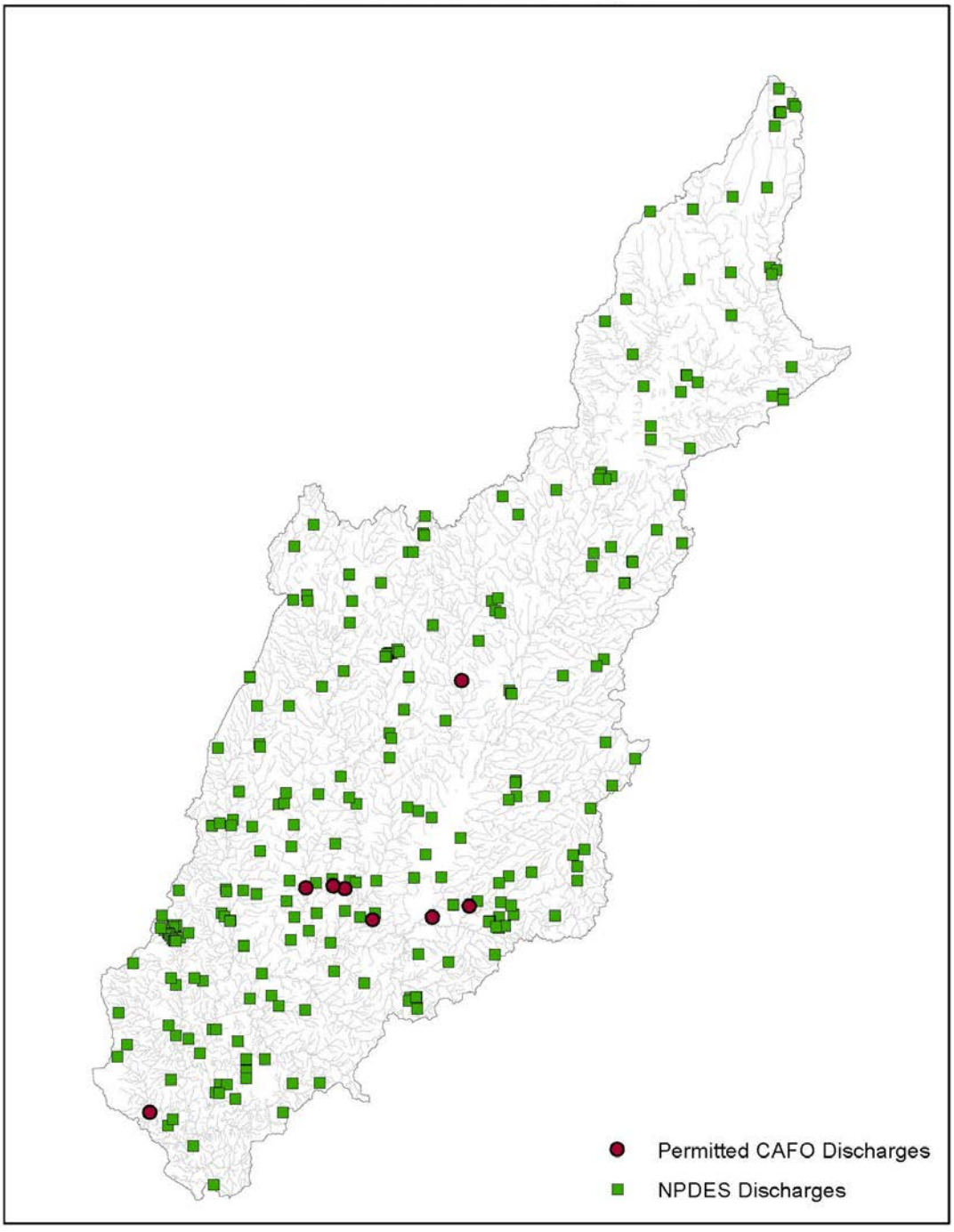

Figure 8. Locations of NPDES and permitted CAFO dischargers in the Kaskaskia River basin.